NCPA Downlink

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Serving Amateur Radio Digital Communication in Northern California

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In This Issue

FCC Censors/Censures Packet Radio

Tom Clark, W3IWI

January 30, 1991

Today a number of packet BBSs on the east coast received citations from the FCC's Norfolk (actually Virginia Beach) Field Office which may well spell the end to much of amateur packet radio. According to Jim, WA4ONG the following packet BBSs (and perhaps others) are involved: N3LA, WA3TSW, KA3CNT, KA3T, WA3ZNW, W3IWI, WA4ONG, WB0TAX and N4HOG [my copy of the citation has not yet arrived in the mail—the details in this message are taken from a copy WA4ONG faxed to me].

The letter dated January 25th from Mr. J. J. Freeman, Engineer in Charge at the Norfolk Office, to WA4ONG states:

"I have received a report that indicates you may have operated your amateur radio station, call sign WA4ONG, in violation of Section 97.113(a) of the Commission's Rules. It appears that you used the Amateur Radio Service to facilitate the business activity of The Coalition To Stop U.S. Intervention in The Middle East.

"Specifically, on or about January 5, 1991 you received a packet radio message originated by amateur radio station WA3QNS. You then transmitted this packet radio message to another amateur radio station. The message was:"

Here appears a copy of the message sent by WA3QNS@N3LA.PA originated at 22:22z on Jan.5 with the

Continued on page 5

NCPA General Meeting Announcement

Eric Williams, WD6CMU
NCPA President

The Annual general meeting of the Northern California Packet Association will be held on Saturday, April 27th at 10:00AM in the board room of the Contra Costa County Water District, 1331 Concord Avenue, Concord. Talk-in will be on 147.735(-). All interested parties are welcome to attend. The agenda for the meeting will be:

- Summary of board actions and plans
- NARC 220MHz reallocation plan
- Election of directors

Editorial

Glenn Tenney, AA6ER

It's amazing what happens when you say that you'll help out a little bit... When the NCPA board went looking for someone to take on the editorship of this newsletter, Larry Kenny, WB9LOZ, and I each agreed to take on part of the duties.

Mike Chepponis, K3MC, has done such a fine job that it looks to be an insurmountable task to do even a fraction of what Mike has been doing since the first issue. I want to thank Mike publicly for the terrific, yet usually thankless, job that he's been doing. Most readers of a newsletter don't understand how much effort it takes to edit. Larry and I are each only doing a small part of what Mike had been doing, and let me tell you that it is a huge job. We hope that over time we'll get the hang of it and the newsletter will meet your expectations.

But a newsletter isn't just editing, typesetting (thanks to Eric Williams, WD6CMU), and printing. Our newsletter is based on articles from you. As you're reading this, why not jot down that little idea or comment you had yesterday. Even though you know all about whatever, there are many people out there who would like to read about it. Don't be worried about spelling, grammar, or punctuation. I'll try to go through and tweak submitted articles. Don't worry about what someone might think. We are our own worst critics.

In this issue, you'll find lots of information on various facets of packet radio. There are regular columns, features, and even something that might make you think...

Producing this issue has taken even more time and effort than I thought. A few days before the deadline for this issue we were many pages short. Now, that we're a bit late, we have almost enough for half of the next issue and I'm faced with the awful task of splitting an article across this issue and the next issue. I don't know how K3MC did it. Thanks again, Mike!

Speakers Available...

The NCPA maintains a list of amateurs willing to speak to clubs and organizations about various aspects of amateur radio. We have speakers available for talks on packet radio, emergency communications, the National Traffic System, TCP/IP, AMSAT, etc. For further information contact Allan Chapman, W6MEO @ WD6CMU.

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Apple Petitions FCC

For Use of Radio Waves For Data Transmission by All Computer Makers

(Editor's note: Many of you may have seen this press release, or even the full petition. What do you think about this? Let us know...)

Washington, D.C
January 28, 1991

Apple Computer, Inc. today filed a petition with the Federal Communications Commission (FCC) that, if approved, would let computers transmit and receive information over radio waves instead of through a wired network. The petition asks the FCC to allocate a part of the radio spectrum so that all computer manufacturers be permitted use of radio waves for wireless computing. Apple believes that approval of the petition is an important step in the establishment of the next generation of personal computing.

Apple's petition paves the way for the establishment of a new class of data communications, called Data Personal Communications Services (Data-PCS). If Apple's petition is approved, personal computer users in the future will be able to communicate with other users and with computer peripherals within a building or a campus over radio waves. This innovation would eliminate the need, in many cases, for local communications to travel on wired networks.

"With the rapid advances in portable computing and wireless communications, we believe it is essential that computer users have access to this vital communications resource in the future," said John Sculley, Apple's chairman and chief executive officer. "Wireless networks will change the nature of information tools, making them as mobile and spontaneous as the individuals using them.

"Apple's action, which will benefit all personal computer users, is motivated by a desire to ensure that the United States will have made the most forward-looking public decisions, allowing wireless networking to become a reality," Sculley added.

Specifically, Apple petitioned the FCC to allow computer communications exclusively on 40 MHz of the radio frequency bandwidth between 1850-1990 MHz to transmit data at high speeds (for example, 10 megabits per second) over short distances (up to about 150 feet).

"The convergence of wireless communications and computers will dramatically change the nature of computing," said David Nagel, vice president of Apple's Advanced Technology Group. "For example, students and teachers would no longer be confined to a rigid classroom set-up. Instead, computing and communications--and therefore learning--could happen any place. Users in the workplace would enjoy similar advantages. Employees would be liberated from the constraints of physical networks, which would enhance creativity and personal productivity," Nagel said.

This type of "spontaneous" or "ad hoc" local area networking would supplement today's wired network configurations, which typically consist of telephone lines, coaxial cables, and fiber optics. The cost, particularly the capital cost, of hardwiring a building is high and then users are restricted as to when, how and where they can use their computers to move data.

Apple recognizes that radio spectrum is scarce and in high demand. Considering this, along with the intense activity being focused on proposals for new voice communications services, Apple is requesting that the FCC move quickly in giving equitable consideration to data communication when determining future bandwidth allocations.

"We're urging the public to support Apple's appeal that the allocation of radio spectrum go beyond voice communications to include an appropriate emphasis on data communications," Sculley said. "Our hope is that computer users will view the allocation of the radio spectrum for wireless computing as Apple does—as an important step in advancing the future of personal computing technology."

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1991 Bay Area Amateur Radio Flea Market Schedule

All Flea markets at Foothill College (Los Altos Hills) are through the courtesy of the operators of the Foothill Electronics Museum of the Perham Foundation. Note: Location Change... Parking Lot C this year, just down from the Museum.

- March 9—Amateurs donation to Palo Alto Red Cross
- April 13—SPECS Repeater Association
- May 11—EMARC Electronics Museum Amateur Radio Club
- June 8—PAARA Palo Alto Amateur Radio Association
- July 13—FARS Foothill Amateur Radio Society
- Aug. 10—Perham Foundation
- Sept. 14—SPECS Users' Group

Sellers $10 (for two spaces) Buyers FREE. Coffee, donuts, hot dogs & pop as always. Talk in on 145.27/repeater or 224.36/repeater Gates open at 6:30 a.m. Come early to get a seller space!!!

Questions? leave a message for Ted, N6IIU@N6IIU-1

Amateur exams have been moved to Sunnyvale. For more information call Sunnyvale VEC (408) 255-9000 24/hrs.

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Editorial Regarding the W3IWI "Incident"

Glenn Tenney, AA6ER

Ok, now you've had a chance to read about this, if you hadn't heard about it before. The March 1991 issue of *QST* has an editorial by David Sumner, K1ZZ, on this incident. His editorial begins by claiming two "facts." His first point being that promoting the use of a 900 telephone number is a violation of FCC regs. On the surface, I would agree with that, but one could easily take an extremists view that even mentioning an 800 number could be a violation. Sumner's description of a 900 number is that it is "the kind that costs you money to call." Well, an 800 number might not cost the person making the call, but the recipient of the call pays for for the call (the carrier receives the money). Would Sumner then say that mentioning an 800 number violates the regs?

Sumner then makes the claim that because the message was addressed to "ALL@USA" it also violates the regs since it "had nothing to do with Amateur Radio" and was "a one-way communication falling outside the definition of 'information bulletin'" and that it therefore "constituted broadcasting". This bothers me much more than does his first.

Reviewing the definitions in Part 97 a bit further finds that such a message could not be construed as being broadcasting. Broadcasting is defined as "Transmissions intended for reception by the general public." A packet message originated by a ham on a ham PBBS is definitely intended for reception by other hams, and not the general public.

Sumner specifically says that "messages addressed to 'ALL' are in effect broadcasts." If Sumner is correct, then any message not addressed to a specific person would be a broadcast. Please note that broadcasting per se is not illegal, just that a broadcast must meet certain criteria to be legal. How many PBBS messages have you seen that are long or short, but addressed to some smaller subset of 'ALL?' How many of those messages made you think and respond? A PBBS, or even an email network, is a conferencing system that is a bit different than a voice repeater. On a voice repeater it would be unlikely to just say something hoping that someone would respond. With a teleconferencing system, that is the norm. Does that make it broadcasting? I think not. Somehow, broadcasting tends to include the expectation of remaining a one-way transmission, whereas a PBBS message expects some response—only the person responding isn't known ahead of time. Should we stop using 'ALL'? There are definitely messages that shouldn't be addressed to 'ALL' (or even a subset of ALL), but not for this reason.

This whole incident raises other concerns though. I think everyone can agree that if a ham originates an inappropriate or illegal message, that ham should be cited. But, what should all other hams do? If you have a packet station up (not even a PBBS, you just have digipeating enabled), and a "bad" message gets repeated through your station should you be liable? I think the answer should be a very clear and explicit NO. The questions raised by this incident are: (1) Will the FCC cite others in the future, and (2) how can we get the FCC regs changed/clarified so that this won't happen again?

The other concern that this raises is: Do hams have any constitutional rights on the air? Do we have first amendment rights? Could this incident have been a problem because it was anti-war? I doubt some of these questions will be answered, but it does make one think.

What will be the result of this: If you run a PBBS, will you now decide to personally read and screen every message going through your station? Will you close down your station? Will you stop digipeating? Will you give up amateur packet all together? Will this squash amateur packet radio? Will this cause many of us to put our energies into Part 15 packet where we don't have to worry about message content at all? Or, will someone submit a request to the FCC to change the rules? Maybe it's time to wonder if it continues to make sense to deprive us of our constitutional rights on ham frequencies.

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The End or the Beginning?

Fred Silveira, K6RAU

Do you remember your first experience soloing behind the wheel of an automobile? The command of mobility, seemingly frictionless "flight," the beckoning horizon—it was all there.

First time packet offered similar parallels—the keyboard command, seemingly an endless myriad of bulletins, and the beckoning of a network which could send messages to all parts of the world.

At some point came the realization of what the awesome responsibility was to glide a several ton vehicle down the roadway. Packet carries its own responsibilities. With a worldwide forwarding network it is important all of us observe that our messages and bulletins meet the rules and regulations of Federal Communications Commission law.

In past years, bulletins have forwarded through the networks extending from sale of telescopes to boats—all illegal under rules governing amateur radio communication in that their subject matter was not confined to the realm and sphere of amateur radio. When discovered, they were deleted and service messages sent back to the originating stations advising of such.

The problem culminated recently when the FCC cited several bulletin boards on the East Coast for forwarding a bulletin originated by a user soliciting funds for a political organization. W3IWI issued a series of bulletins titled "URGENT" detailing the matter. They are printed elsewhere in this issue.

As it applies to the future of packet network forwarding, it is incumbent upon all of us to review, consider, and reflect upon the ramifications of this recent event.

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FCC Censors/Censures Packet Radio

Continued from page 1

BID #21035_N3LA, Subject: Call This Number ASAP. The message listed the business telephones and fax numbers for "The Coalition" as well as a 1-900-xxx-xxxx number to call to "register your voice" I won't repeat the bulletin here, because repeating the bulletin would make it illegal to send this message!

"This activity was a facilitation of the business affairs of the Coalition to Stop U.S. Intervention in the Middle East and therefor [sic] in violation of Section 97.113(a)."

The FCC citation then contains the boilerplate demanding a response within 10 days explaining circumstances and correct actions, and then closing with a chilling "to determine what, if any, enforcement action is required to insure current and future rule compliance" and a statement that future transgressions will bring fines and/or license revocation.

That's the facts. I'll now discuss some of the implications and recommended actions.

The Implications

The implications of the action by the FCC's Norfolk Field Office are absolutely appalling. What is implied is that each and every station in a store-and-forward network is responsible for the actual message CONTENT passing through each node. The BBSs were cited because their calls were in the message header "audit trail." The FCC's action states that each BBS SYSOP is personally responsible for the "correctness" of all messages merely passing through his system. Here, the W3IWI mail switch handles about 10,000 messages per month automatically. There is NO WAY that I can vouch for every bit that passes through!

If the FCC had instead gleaned its information from on-the-air monitoring, then all the THENET/NETROM/ROSE/TCPIP/DIGIPEATER switches handling the message would have been equally culpable! The implication of the FCC action is that a node control operator must read all information and be prepared to shut the system down at the first hint of an "inappropriate" message. It's hard enough to watch the information passing on 1200 BPS links—imagine the impossibility of "censoring" 56 kBPS or faster channels.

In future networks where redundant channels exist, it is quite possible that a given message will be fragmented and parts of it sent via several parallel paths. The message may exist as a complete entity only at the ends of a virtual path. It would be impossible to implement the censorship the FCC seems to be demanding with such a network, so the "legality" will interfere with development of new technology.

Consider another recent development: amateur packet radio satellites. PACSAT is licensed by the FCC with a US trustee and a cadre of US sysops. PACSAT is, in essence, a flying BBS with the sysops on the ground. In order to screen out "offensive" messages, a ground-based SYSOP has to use a radio channel to verify message CONTENT. But the FCC letter says that the very act of reading an "offensive" message on the radio is illegal. If the Norfolk FCC action is allowed to stand, the logical implication is that PACSATs must be turned off!

A number of us have discussed such issues with responsible individuals at the FCC in Washington ever since the first fledgling days of packet radio. The signal that the FCC sent was that the sole responsibility for the CONTENT of a message lays with the ORIGINATOR. The actions of the Norfolk Office seem to indicate a new policy has been adopted which effectively kills packet radio.

Or—perhaps—the Norfolk Engineer in Charge who issued the citations was offended by the particular message and chose to take out his frustrations on all the "King's Messengers" who brought the message to him?

W3IWI Comments and Recommendations

It is ironic that the WA3QNS message that brought down the wrath of the FCC a number of the BBSs that "touched" his message brought a very vocal response from the packet community informing him that

(1) 1-900-xxx-xxxx are in fact commercial ventures designed to raise money and that a call to the number would cost the caller.

(2) The subject message was probably in violation of 97.113(a) and probably illegal

Personally, I have been silent (but very frustrated) that about the 10% of bulletins addressed @USA (or @ALLUS, @ALLBBS, etc.) that are in poor taste. I have grown tired if blather about censorship, First Amendment Rights and the incredible volumes of hate mail. WA3QNS, by his statements and by the responses to his statements from other folks, has been one of the causes of this frustration. I have longed for the return to normalcy with messages on technical topics and personal communications. I have found it frustrating to pay the electric power bill and pay for the W3IWI hardware for others to engage in marginally offensive "Free Speech." I have wished that the (ab)users of @USA would have exercised more discretion with self-censorship.

But I have gritted what teeth I have left and avoided being a censor. Now, the FCC's CENSURE has left me with no alternative than to be a CENSOR.

Until the FCC tells me that I can do otherwise, I will only release @USA messages that I personally screen and am willing to stake my license on. The priority on my time is such that I don't expect to have time to screen @USA bulletins. Any complaints about my decision will be sent to /dev/null.

For the vast majority of you who do not abuse the system, I'm sorry that this situation has come up and that your ability to "fan out" information will be hindered. Since there have been very few instances of "offensive" personal messages, I'll take the risk of keeping all other packet mail flowing here and I hope the other BBS SYSOPs do likewise. But PLEASE exercise self-policing. The BBS SYSOPs don't want to be held responsible for YOUR words.

The ARRL has already been informed about the Norfolk citations. Because of the potentially devastating impact on all packet radio if the Norfolk situation is allowed to stand, I anticipate a lot of phone calls to be made in the next few days!

73 de Tom, W3IWI

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A Blow-By-Blow Account of the 1991 TAPR Annual Meeting

Paul Williamson, KB5MU

(Editor's notes: I haven't seen a more complete, informative, and well done set of notes of a ham or any meeting. We're including Paul's notes, with his permission, virtually complete and with the most minimal editing. This article is chock full of information, but we just didn't have enough room in this issue for all of it. This is the first part of Paul's notes. Look for the rest of this fantastic reporting job in the next issue. Enjoy!)

The following is based on the notes I took during the TAPR annual meeting. Any mistakes are mine. On no account should you assume that this account represents the official position of TAPR or anybody else. But I hope you find it interesting.

The TAPR Annual Meeting was called to order by "Packet" Pete Eaton, WB9FLW, at 9:00 a.m. on 2 March 1991 at the Inn At the Airport in scenic Tucson. The attendees introduced themselves; the usual suspects were present from all over the country.

Bob Nielsen, W6SWE, new President of TAPR, announced the new Directors and Officers:

President: Bob Nielsen, W6SW—also new director

Vice President: Harold Price, NK6K

Sec/Treasurer: Greg Jones, WD5IVD—also new director

new director: Jerry Crawford, K7UPJ

Greg Jones, WD5IVD, presented the proposed agenda for the meeting.

Bob Nielsen, W6SWE, introduced Bob Hansen, the new editor of the PSR. Bob Hansen stated that, as always, he's looking for articles for the PSR. If you're doing something interesting locally, even if it seems like old hat to the local crew, it can make an interesting PSR article. Examples: database applications, video, 9600 bps interfacing, regional activities, networks with special features, DX nodes, WX nodes. Ghost writers can be provided if you're afraid your prose isn't ready for prime time. PSR also accepts would-like-to-get- in-touch-with and help-wanted notes. PSR would like to receive as many local newsletters as possible.

Question: Would it be possible for PSR to routinely publish a list of local and regional groups? Answer: Sure. Everybody please tell me about your local and regional groups, and PSR will print it.

The one and only Heather Johnson (TAPR office staff and "the Mother of all Johnsons") was introduced. She welcomed everyone to Tucson, and apologized for the weather (it was raining). She announced the hospitality suite in the hotel, where she'd be holding court to sell various merchandise and accept membership renewals. Kit prices may be going up, so she urged us to buy now. TAPR office hours will be more strictly observed: 10:00 AM to 3:00 PM Tuesday through Friday. The answering machine will take your message other times, but Heather would rather speak to you in person (and you'll enjoy it more too - Paul).

Pete Eaton, WB9FLW, presented a corsage to Heather, in appreciation for all the hard work. He described her as TAPR's biggest asset and Secret Weapon.

Harold Price, NK6K
Microsat status report

This is the first TAPR meeting since the Microsats became operational. Four microsats were launched; one was half funded by TAPR out of the proceedings of TNC-2 sales. The satellites were designed by AMSAT, but the funds came from various organizations around the world.

Microsats serve as floating BBS stations, and they are optimized for that application. About 9 inches on a side, they weigh 22 lbs and carry 3 transmitters, 6 receivers, a NiCd battery pack, a computer with 8 megabytes of memory, serial ports, and a telemetry and control system. A slide of AMSAT OSCAR-16 was shown. These satellites are much simpler than AO-10 or AO-13, since the payload is basically a computer, and the orbit is low. They contain no moving parts. Attitude control is required to control thermal problems: hot on one side and cold on the other is only good for McDonald's BLT's. The attitude control system consists of magnets which tend to align the Z axis, a solar windmill which tends to spin the satellite faster and faster, and lossy hysteresis rods which regulate the spin rate by dissipating energy. The photovoltaic panels generate an orbit average of about 8 watts, and the battery pack levels the voltage over the orbit.

The satellites were originally supposed to be stamped out like cookies from a cookie cutter, but it didn't work out that way. Every satellite was different in some way. A slide of WEBERSAT OSCAR-18 shows the penthouse (or attic, depending on who you ask) containing a Canon CCD-based video camera. The camera experiment samples the NTSC output from the hardened stock camera assembly. This permits color to be recovered from the sampled image. For example, Franklin Antonio, N6NKF, has written a program that extracts good quality color images from WEBERSAT pictures. Unfortunately, no good pictures have been taken since WO-18 was launched.

A picture of DOVE OSCAR-17 is dominated by Junior De Castro, PY2BJO, a major benefactor of the Microsat program. DOVE transmits on 2 meters FM through its outsize downlink antennas. The primary mission is a digital voice encoder intended for educational uses.

A picture of a partially assembled Microsat illustrates the stacked slice chassis concept. Another picture shows the wiring harness: a simple 25-pin ribbon cable. Various analog voltages from telemetry points are multiplexed onto just one of the wires, under the control of a serial local-area-network that logically interconnects the stacked modules.

A picture of the AMSAT lab shows key workers Jan King and Jeff Zerr. Many other credits for work on design, flight integration, and software were recounted. A picture of preparations for thermal vacuum test illustrates the kind of special resources that can be obtained through connections. Some of the leading enthusiasts have been "doing satellites" since 1970, and in the meantime

Packet Radio Reaches New Heights

Tony Bamberger, N6TYG

(Editor's note: Tony's article was previously published in the September issue of QEX. The experimental work Tony is doing in the CDF Volunteer In Prevention program should be very interesting to our readers. This might also be the kindling for some hot new software or packet applications.)

Recently I had the opportunity to be part of a demonstration put on by the California Department of Forestry and Fire Protection (CDF) for the State Fire Marshall's conference at the Asilomar State Conference Grounds in Pacific Grove, California. The demonstration was two fold. First to show the operation of a new fire mapping system CDF is testing called "LoranPlot," and secondly the operation of the VIPCOM1 communications bus manned by CDF trained Amateur Radio operators.

The LoranPlot project was started to assist in the real-time mapping of the perimeter and area of a fire from the air. LORAN is a system of LOng RAnge Navigation in which pulsed signals sent out by two pairs of radio stations are used to determine a geographical position of a ship or aircraft using the time of arrival of the the signals. The LORAN navigation system installed in CDF helicopters have provisions to collect the real-time Longitude and Latitude information via an RS-232 serial link. Utilizing a standard "laptop" computer it is possible for the pilot or observer to start and stop the data collection when or where desired as well as add comments into the data file. These comments are usually simple descriptions, for example: "BARN," "HOUSE," "CAR," etc. to add emphasis to the plotted data. Normally after completing a plotting run it is necessary for the pilot to land the aircraft and take the computer to another location. Here the computer is hooked up to a plotter and the information is plotted onto a standard topographical map utilizing additional plotting software on the laptop computer.

Even though this system is far superior to the old manual method of drawing on a map by hand while flying over the fire area, there is still a time lag in processing the data because the aircraft must return to its base where the computer can be hooked up to a plotter to view the information. With a fast moving fire the information is outdated before it can be plotted...

Well at this point you're probably saying "This is interesting, but what does it have to do with Amateur Radio..." Well I'm glad you asked! Seeing a chance to try some *experimental* radio work, a group of hams from the CDF "Volunteers In Prevention" program came up with the idea of transmitting the ASCII data from the airborne computer down to the ground using Amateur Packet radio. The possibilities were endless for this type of communications. Not only could the information be collected from the aircraft locally while it was flying overhead, but if it were necessary, the data could be relayed hundreds of miles using the Packet Backbone network. With this motivation in mind, here is how we made it work...

The pilot, Fred Nunes (N6CYA) was using a 440 Mhz ICOM HT and a Heathkit Pocket Packet TNC into an antenna off the bottom of the helicopter. The laptop would do double duty first running the "LoranPlot" collection software, and then controlling the Packet TNC using the PROCOMM communications software. Prior to the actual demonstration, a long distance data transfer test was successfully conducted between the helicopter base (at Alma fire station in the mountains above Los Gatos, California) and the communications bus setup 70 miles away at the Asilomar conference grounds. By linking through the Northern California Backbone network, we connected and successfully transferred sample navigation plot data.

For the live demonstration, Fred flew over the area of a previous fire while collecting the data from the LORAN using the laptop computer. After the data was collected, Fred "CONNECTED" to the Packet station onboard VIPCOM1 and downloaded the plot data using PROCOMM. Two minutes later the transfer was completed, and Fred was free to plot another area or continue his primary mission of "fire suppression." At this point the collected data (stored on floppy disk) was edited to remove the "CONNECT" and "DISCONNECT" messages and was then processed by the plotting software which plotted out the fire perimeter (with comments) onto a topographical map. Time from start to finish, 5 minutes from initial Packet "CONNECT" to plotted results...

Was the demonstration a success? Judging from the applause and comments from the audience of State and Local fire officials, it was a resounding success! Amateur Radio once again proved the feasibility of new technology. In the future this system would work on State radio frequencies using commercial TNC's, but the technology was proven using Amateur knowhow and equipment! After the demonstration, tours of the communications bus were given and the capabilities of Voice, Digital (Packet), and Amateur Television were explained to the participants. Many of the officials were familiar with RACES, but were not aware of all of the capabilities hams could provide...

Special thanks to: Fred N6CYA, Dick KB6MRM, Jim KA6YRK, Chris W6/G8HJD, and Mike KB6PDA for making this all work.

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TAPR Annual Meeting

they have risen to positions of authority in their companies. Having a company bigwig fetching and toting cables makes a big impression on the other employees; this makes it easier to get cooperation from them!

A picture of a Microsat with the hood open shows that the modular stacksat concept makes it relatively easy to service. (At least, that's the theory. - Paul) A picture of UoSAT OSCAR-14 provides a contrast. It weighs 60 kg, about twice as big as a Microsat. The wiring harness contains more than 400 wires. It does contain more redundant subsystems than a Microsat; the Microsat

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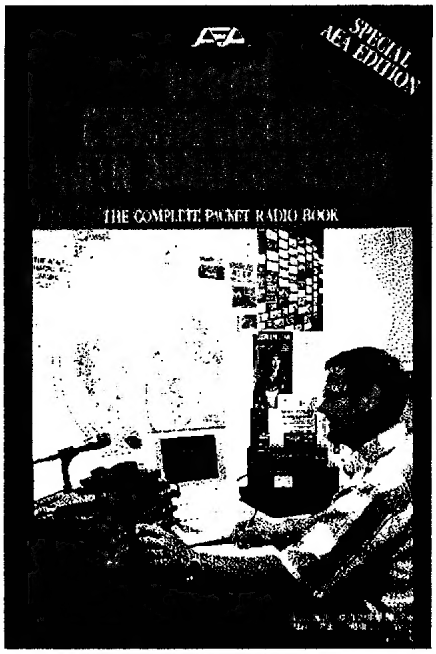
Book Review

Pat Mulrooney, N6QMY

This special AEA (Advanced Electronic Applications, Inc.) edition has been adapted from a book of the same title by Jim Grubbs imprinted for Radio Shack.

Digital Communications With Amateur Radio,is written as a very basic introduction to Amateur Radio and telephone line digital modes. It is not just an introduction to packet radio. The book is geared towards both the computer hobbyist looking for something new to do with his computer and the Amateur Radio operator wanting a basic understanding of digital modes and techniques.

The book opens with brief survey of Amateur Radio and computer communications. But with phrases such as "What may come as a surprise to you is that data is also flowing right by your head now as you read this words. Electromagnetic waves of all kinds are carrying computer information to points around the world with using wires to do so!" the book sets its tone at the very basic level. The book then moves into a basic overview of digital theory, covering terms as: serial and parallel lines, half and full duplex, asynchronous and synchronous communication, and modems.



And that completes the introduction. From there we move to Amateur digital modes. Every wondered how a mechanical Baudot teletypewriter worked? There is a full page drawing if you are interested. Even a section on punched paper tape is included. FSK and PSK are covered and some basic computer hardware connections for radios are shown such as AEA Computer Patch and Comm 64. Moving into the world of packet radio we look at the OSI seven layer model, AX.25 and CSMA. A big jump for a book that a few chapters ago was wondering if we know "Electromagnetic waves of all kinds are carrying computer information."

A history of TNCs are covered, then the offerings from AEA are shown. On the air operating procedures are covered, but using AEA software.. Some of the basic TNC parameters are given review also. Networking is next, with such topics as channel congestion, hidden nodes, LANs and WANs, and the gateway concept. (The BBSs in NCPA follow the gateway concept.) Software and hardware to make your PC act as a TNC is touched briefly.

A chapter on packet radio accessories follows. Offerings from companies other then AEA and Radio Shack are mentioned. But as the copyright of this book is 3 years old, there are many new products out on the market today. Packet organizations are covered, but sadly no listing of NCPA.

The book then closes with a brief chapter on the packet satellite operation. Again, here the book shows its age.

As I stated at the beginning, this book tries to serve the need of both the Amateur Radio operator and the computer hobbyist. There is not enough information here for the computer hobbyist to get on the air, and not enough information to completely help the Amateur Radio operator who is on the air. Trying to serve the needs of both, it does neither. EOF

MARS and the Digital World

Allan Chapman, W6MEO

Military Affiliate Radio System comprises mostly volunteer hams, operating at a home QTH. Active duty service members are in some key positions at gateway stations, but many are closing.

MARS operates on military frequencies outside the ham bands, and competition is fierce within and between services, other government agencies, industry, and the rest of the world! A secondary support and morale mission does not have a lot of leverage. So, MARS is very gradually learning efficiency and spectrum economy through more modern techniques.

Here in Northern California we find that NTS (amateur) traffic is refiled into, or taken from, MARS by members using packet, RTTY, SSB, FM, telephone, sometimes even U.S. Postal "Service." The one biggest hassle right now is determining where overseas we can address a message. It changes nearly daily in some way; it varies between the 3 services; requirements seem to be tough, but enforced locally only sporadically.

To enter an ordinary Traffic message via packet (or any other medium), the ham sends it to either a known member, or uses the NTS routing for the destination. Format is not as important as content, since the MARS member must massage the data into correct format. Follow **exactly** the most stringent set of MARS rules, knowing that a guy named Murphy is downstream just looking for flaws as a reason to K)ill your message because that reduces his backlog. Steve Harding KA6ETB has incorporated those rules into this file on NCPA BBSs: NTS/mars.NTS.

Those who want info on MARS membership should +NOT+ try to use forms from a friend who happens to have one. They are usually obsolete and will bounce. Instead, write to:

Chief Army MARS
USAISC/AS-OPS-OA
Ft. Huachuca, AZ 85613-5000

Chief Navy-Marine Corps MARS
Navy Comms Unit
Washington, DC 20390-5161

Chief USAF MARS
Hq AFCC/DOYX(MARS)
Scott AFB Il 62225-6001

73,
W6MEO @ WD6CMU
aka afa6jv

EOF

Young Folks and Ham Radio

Travis Wise, KB8FOU

(Editor's note: Travis is an active 15 year old ham who is working hard to encourage other young people to check out Ham Radio. He serves on the Board of Directors for the West Valley Amateur Radio Association, and distributes many bulletins via the packet BBSs regarding youth involvement with ham radio. Travis continues writing from a perspective that all of us over the age of thirty need to recall — even if it is ancient history to us. Could this view be insightful? I hope so.)

We all know that young folks are important to the survival of Amateur radio, and that fact has been brought out with the arrival of no code. Since the FCC quickly dropped no code on our doorstep, hundreds of hams rushed to their packet terminals and sent out their opinions about no code to ALLUS. Most of the bulletins which were pro-no code mentioned something about the importance of youth in our hobby. Whether you are pro-no code or not, we can all be agreed on one thing: today's young hams are the future of ham radio.

The saying: "The average age of a ham radio operator is dead" is no longer true! The average age is, in fact, 51.19 (as of 1988). Richard Hoffbeck, N0LOX, has prepared a two page report which breaks down the ages and dispels some myths about ham radio's age problem. Just how bad of a problem is it? Well, Richard thinks that in 20 years, it will be a "troublesome problem." In 1988, there were about 480,000 hams in America. Of those, 3%, or 10,345 were under the age of 20. Three out of one-hundred! Think about your local ham club. Are there three young hams per one-hundred? Probably. Keeping in mind that about half of all hams are active, there are about 5,000 active young hams in America. While these figures are from 1988, they are probably still accurate.

Richard also reports that it is false to assume that since the number of hams has been growing at a faster rate than the population as a whole, ham radio is at no risk of becoming a dying hobby. It is faulty to assume that society as a whole has remained at the same level of technology.

How does all of this fall in with packet? Well, you have probably seen a few bulletins go by from teachers who use amateur radio in their classrooms, and are looking for other hams to exchange messages with their students. I have a list of about fifteen of these schools. There are also about thirty young hams on packet nationwide who I have come in contact with in the last year. I am hoping that with the codeless Technician license that these numbers will grow, and every club will have a ham radio class, and every school will have a ham radio club...someday.

When I first started my campaign to find other young hams in packet radio, I received one message from a grouch who didn't think packet radio was the place for a newsletter/bulletin regarding packet. He has been proved wrong by the tons (or shall I say, bytes?) of messages I have received in overwhelming support of "The Packet Racket." I now have a list of about twenty young hams who I correspond with often, some of which have their Advanced license!

Now that The Packet Racket is in it's 10th edition, I have received only a few comments from the HF gateway Sysops asking me to reduce the size of the bulletin to below 3KB (the first 3 editions were over 5KB). I have tried my best to do that, and each message is now under 2KB.

So, while many folks are sending 5KB+ files all over the country about the War and other such topics, I'm doing my best to help the HF gateways be as efficient as possible.

I think packet is the future of Ham radio, along with satellites, and maybe even moonbounce. I'm hoping that within a few years, all packet will be 9600 baud, and HF packet stations can operate automatically just like VHF stations, without the yearly "okay" by the FCC (that is ridiculous). It's obvious now that, at least in the Bay Area, we are going to have to increase the number of packet frequencies in the near future, as well as continue to encourage packet activity as well as the TNC has.

So, while we wait for our numbers to swell, someone to totally revamp the packet system so that it can handle infinite quantities of messages, and devise a forwarding system such that the propagation on HF won't make a difference, we can sit back, and read the mail, and enjoy packet radio, and the great amount technology that exists in the small box next to our computers.

73 de Travis, KB8FOU @ N6IIU.

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PPRS is alive and well...

Northern California's oldest packet radio user group is still meeting every month. The Pacific Packet Radio Society (PPRS) meets on the first Tuesday of each month at the Ampex Cafeteria, 411 Broadway, Redwood City. The meetings start at 7:30 p.m. and are over by about 9:30.

Over the years, meetings have had as many as a hundred people. The October, 1989, earthquake kept us from meeting in the cafeteria for a few months. Since then, attendance has dwindled to one to three dozen people. Please join us for a meeting this year. This can be a great place to get together and get questions answered.

The Ampex Cafeteria is located in the same building as the Ampex Museum, facing the reflecting pool. This is just West of 101 and about a mile South of Woodside Blvd.

Putting TCP/IP On The Air

Larry Kenney, WB9LOZ
NCPA Education Coordinator

There have been several articles written about various aspects of TCP/IP here in "*Downlink*," but one has been missing. In issue number 1, Dewayne, WA8DZP, gave you an overview and a detailed explanation of the protocols used. In issue 2, Doug, N6OYU, explained the TCP/IP Callsign Server and in the last issue there were three articles relating to TCP/IP: details from Weo, WN6I, on his San Jose Switch, a book review from Pat, N6QMY, on "Internetworking with TCP/IP," and a new column on TCP/IP from Dewayne. However, there has been nothing written on where to find the software or how to go about getting a station on the air. Seeing that I recently set up my station on TCP/IP and the information is fresh in my mind, so I'm going to tackle that in this article.

Getting your station set up will require some time and effort on your part. You can't just put a disk in your computer and go on the air. You have to get an IP address, set up specific directories, get some needed files, and make up a few necessary files for your operation. You also need a TNC that operates in KISS mode. Most now have the KISS command available, but check your TNC operating manual before you start anything else to ensure that the KISS command is available in your TNC. Also while you have the manual out, learn how to use the KISS command; it works differently from most commands you're familiar with.

The Software

The first thing you need, of course, is the software. The KA9Q Internet Package, commonly called NET, is the most common program in use today. There are versions available for the PC and clones, the Macintosh, Amiga and Unix. Where do you get it? The easiest source is a local ham that has a copy of the version you need. Put a message on your local BBS to see if there is anyone in your area that is already on TCP/IP. Not only will you be able to get the software from him, but you'll have someone to ask questions of if you have problems.

The Tucson Amateur Packet Radio Association (TAPR) has the version for the PC and clones available for $4.00. This is a special "Plug and Play" set of disks with sample files included along with instructions for setting up your hard drive with the proper directories. You can write to them at TAPR, PO Box 12925, Tucson, AZ 85732, or call them at (602) 749-9479.

If you have a telephone modem, there are several sources available to you. You can download the package from some of the ham related telephone BBSs. Here in Northern California you can call Dennis Humphrey WA6RDH's BBS in Dixon at (916) 678-1535. The software is also available on Howard Leadmon WB3FFV's BBS in Maryland at (301)-335-0858, or Gary Sanders N8EMR's BBS in Ohio at (614)-457-4227. All accept 1200/2400, 8 bits, no parity, 1 stop bit. The software is also available from Compuserve in the Hamnet section. If you have a DRSI plug-in TNC, you already have what you need. A copy of the TCP/IP software that has already been configured for use with the DRSI card was included with it.

IP Address

In addition to the software, you also need to obtain an IP address. This is a series of numbers that will uniquely identify your station on the air. To get an address assigned to you, contact the IP address coordinator in your area. In the Bay Area it's Douglas Thom, N6OYU @ K3MC, and in the Sacramento area it's Bob Meyer, K6RTV @ WA6NWE. In other areas, ask around to find out who the local IP address coordinator is, or contact Brian Kantor, WB6CYT, the national IP address coordinator, at 7108 Werner Street, San Diego, CA 92122.

Send the following information with your request:

- Your first name, last name and callsign.
- Your full mailing address.
- The city where your TCP/IP station is going to be located.
- Whether or not it's a home or work location.
- The callsign of your home BBS.
- Your Internet address, if you have one.

Files Needed

A copy of the HOSTS.NET file is also required. It's available for downloading on many of the packet BBSs in Northern California or from the WN6I-7 San Jose Switch on 145.75 MHz. If using your local packet BBS, check for a TCP/IP directory using the W command. If you can't locate the file, ask your local sysop for assistance. The file is fairly lengthy, so plan on spending a little time downloading it. The HOSTS.NET file is used by the NET software to look up the IP address for each station you wish to contact, so you'll need it before you go on the air with your TCP/IP station.

If you're using the PC/clone version of NET, I strongly suggest that you also get a copy of the file BEGIN.DOC, written by Gary Ford, N6GF. It explains what you need to do to set up your station in clear, easy to understand terminology and then goes into details on all of the commands used with the NET program. There is documentation that comes with the software, but I found it to be difficult to understand in many places. It also isn't as complete as Gary's and the descriptions of some of the functions are missing. Gary's documentation takes all of the guess work out of the process.

There are two other files you'll also find very helpful once you're up and running. One is called FINGER.DOC, describing the user identification application, and the other is BM.DOC, the "BM User Manual" by Dave Trulli, NN2Z.

All four files, HOSTS.NET, BEGIN.DOC, FINGER.DOC and BM.DOC, are available in the TCP/IP directory of the W6PW-3 BBS on 144.99 MHz in San Francisco. If you can't connect to that BBS or find a copy of the files locally, send me a formatted disk with return postage and I'll be glad to make a copy of the files for you. I can copy to 3 1/2" 1.44M or 5 1/4" 1.2M or 360K disks. My address is 4145 21st Street, San Francisco, CA 94114.

Hard Disk Setup

Before installing the program on your computer, special directories need to be established on your hard drive for use by the TCP/IP program. Under the root

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TCP/IP Column

Dewayne Hendricks, WA8DZP

In my last column I discussed some of the background and what I called the "why" of TCP/IP. I hope that you found the information there useful. Since no one has sent me any questions about the last column, I can only assume that everyone out there understood it and would like me to move ahead. In this column I had promised to discuss the "how" of TCP/IP and how you could get started with the available implementations for the type of personal computer which you have. However, I worked out an arrangement with Larry Kenney WB9LOZ, who writes the excellent "Introduction to Packet Radio" series to instead write a "how to" article for this issue. Larry just brought up TCP/IP at his own station so we felt that he would be in a much better "state of mind" then I to write about what it takes to get a TCP/IP station on the air. Larry's article in on how to get TCP/IP up on an IBM PC or compatible. If there is enough interest on how to do the same with other platforms (Macintosh, Amiga, UNIX, etc.) then we will do a "how to" column for those platforms also.

In past issues of Downlink, I have written about the lower levels of the TCP/IP protocol suite. I have covered briefly what are called the "Transport" (TCP and IP), and "Internetwork" (IP and ICMP) protocol levels. In this column I would like to discuss some of the highest level protocols of the TCP/IP protocol suite. These protocols of the TCP/IP protocol stack are called "application protocols." They communicate with applications on other internet hosts and are the user-visible interface to the TCP/IP protocol suite.

Characteristics of Applications

All of the higher level protocols have some principles in common:

1. They can be user-made applications or applications which are standardized and shipped with a TCP/IP product, such as NOS. As I've mentioned in the past, the TCP/IP protocol suite includes such "standard" application protocols such as:

- TELNET (TELetypewriter NETwork) for interactive access to remote internet hosts.
- FTP (File Transfer Protocol) for high-speed disk-to-disk file transfers.
- SMTP (Simple Mail Transfer Protocol) as an internet mailing system.

These are the most widely implemented application protocols, but a lot of others exist. Each particular TCP/IP implementation will include a more or less restricted set of application protocols.

2. They use either UDP or TCP as a transport mechanism. Remember that UDP is unreliable and offers no flow-control, so in this case, the application has to provide its own error recovery and flow-control routines. It is often easier to build applications on top of TCP, a reliable, connection-oriented protocol. Most applications protocols use TCP, but there are applications built on UDP for special reasons, such as higher performance available through its use of a connectionless architecture. An example of such an application is the Network File System (NFS) protocol which was developed by SUN Microsystems and allows for the remote access of file systems over the Internet.

3. Most of them use the server-client model of interaction.

Server-Client Model

Let me elaborate a bit on this notion of server-client (yes, not client-server!). TCP is a peer-to-peer, connection-oriented protocol. There are no master/slave relationships allowed in the protocol definition. Most applications you can think of though use a server/client model for communications. A "server" is an application that offers a service to internet users; a "client" is a "requestor" of a service. An application consists of both a server and a client part, which can run on the same or on different systems. Users usually invoke the client part of the application, which builds a "request" for a particular service and sends it to the server part of the application using TCP/IP as a transport vehicle. The server is a program that receives a request, performs the required service and sends back the results in a "reply." A server can usually deal with multiple requests (multiple clients) at the same time. Some servers wait for requests at a "well-known port" so that their clients know to which IP socket they must direct their requests. The client uses an arbitrary port for its communication. Clients that wish to communicate with a server that does not use a well-known port must have another mechanism for learning to which port they must address their requests. This mechanism might employ a registration service such as "Portmap," which uses a well-known port. NOS as it stands does not implement such a service and applications which are currently implemented all use well-known ports. Let's go more into detail of one of the more common application protocols, TELNET.

TELNET

The TELNET protocol provides a standardized interface, through which a program on one host (the TELNET client) may access the resources of another host (the TELNET server) as thought the client were a local terminal connected to the server. For example, the TELNET command from an IBM PC running a TCP/IP implementation under DOS may be used to login to a UNIX host, making the PC look like a UNIX user's terminal to the host.

The TELNET protocol is based on three ideas: first, the concept of a "Network Virtual Terminal (NVT);" second, the principle of negotiated options; and third, a symmetric view of terminal and processes. An NVT is an imaginary device, providing the necessary basic structure of a standard terminal. Each host maps it's own terminal characteristics to this NVT, and assumes that every other will do the same. The principle of negotiated options is used by the TELNET protocol, because many hosts wish to provide additional services, beyond those available with the NVT. Various options may be negotiated. Server and client use a set of conventions to establish the operational characteristics of their TELNET connection via the "DO, DON'T, WILL, WON'T" mechanism. To begin the negotiation, hosts have to verify their mutual understanding, using a standard syntax. Then, after a minimum of understanding, they can experience sub-negotiation under a

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Putting TCP/IP On The Air

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directory (C:\ on most systems) you need to make directories titled FINGER, PUBLIC and SPOOL, as shown in the diagram. Under the SPOOL directory you need to add four sub-directories called FOLDER, MAIL, MQUEUE and RQUEUE.

```
\ (root directory)
      |
      |—FINGER
      |—PUBLIC
      |—SPOOL
            |
            |—FOLDER
            |—MAIL
            |—MQUEUE
            |—RQUEUE
```

The FINGER directory is used to identify users of your TCP/IP station. The file FINGER.DOC explains the operation of the FINGER application and the files needed in this directory. The files are NOT needed to put your station on the air with TCP/IP.

The PUBLIC directory, and any sub-directories you want to add to it, is the area accessible to users of your station, similar to the files area of your packet BBS. You can develop this area after you get on the air and become familiar with TCP/IP operation.

The SPOOL directory is used for your automatic station log.

The FOLDER sub-directory is where files are stored when you save any messages as files.

The MAIL sub-directory is where incoming messages are stored.

The MQUEUE sub-directory is for outgoing messages.

The RQUEUE sub-directory is for messages that have been received for processing by a user-defined mail routing program. (I have no idea what this is about. Nothing has ever ended up in RQUEUE on my station.)

Files Used

Next, you need to make up a couple of files used by the NET program. The documentation that comes with the program gives you examples of what you need to enter in these files.

The first file is AUTOEXEC.NET, a series of commands and information needed by the program. (This file should not be confused with your AUTOEXEC.BAT file.) When the NET program first starts up it reads this file and executes the commands contained in it, setting up the initial configuration for your system. It sets the hostname, AX.25 parameters, interfaces and other variables necessary for your particular station. Make sure that you have the correct entry for the COM port you're going to use for your TNC. Most enter "ax0" for COM1.

The next file you need to write is FTPUSERS. It establishes the access levels for users of your station. Be very careful when writing the information for this file or outsiders will be able to get into your private personal files. It's not advisable to give permission above level 3, as outlined in the documentation.

Both of these files, AUTOEXEC.NET and FTPUSERS, the file HOSTS.NET, and the files NET.EXE and BM.RC that come with the software package, are placed in the ROUTE directory.

Putting it all on the air

When you have all of the files saved to the proper directories you should be ready to go on the air. Set up your radio for simplex operation. The TCP/IP frequency in the Bay Area is 145.75 MHz, and in Sacramento it's 144.93 MHz. If you live in another area, ask around locally for the frequency used.

Using your normal computer terminal program, check your TNC to computer baud rate and make sure that it matches the baud rate you entered in AUTOEXEC.NET. Set DWait to 0, Persistence ON, and SLOTtime to 160 ms., then turn KISS ON. As explained earlier, the operation of KISS mode varies from normal command usage, and even varies from TNC to TNC, so read your TNC manual for details on the KISS command. With the AEA PK-232 you will also have to turn HOST ON. Be careful that your terminal program doesn't take you out of KISS mode when you exit it. Some do! I use Pro-Comm and it works fine.

When the radio and TNC are ready, enter NET at the DOS prompt, cross your fingers and see what happens. You should get the prompt "NET". My station came up on the first try! I hope yours does also.

To monitor the frequency, you will need to enter "trace cmdmode" <CR> followed by "trace ax0 111" <CR> (ax0 is assuming COM1). These two commands can be added to AUTOEXEC.NET if you want automatic monitoring. That way you don't have to type it in each time you come on line.

The first thing you'll probably want to do is to see if eveything is working okay. The easiest check is to make an AX.25 connection with another station that you know is on frequency. Enter "connect ax0 <callsign>" <CR>, where <callsign> is the station you want to connect to. For example, to connect to WB9LOZ you would enter: c ax0 wb9loz. If everything is working as it should you will soon receive "conn pending" followed by "connected." After spending all of your time and effort setting up your TCP/IP program, you have now completed a normal packet AX.25 keyboard to keyboard contact! To disconnect, use the F10 key to escape back to the NET prompt, and then enter "disconnect" or "d". (Most of the commands can be abbreviated.)

If your station is working, congratulations! You now have the world of TCP/IP awaiting you. Using the documentation provided with the software, or better yet, BEGIN.DOC, you can now start checking out the various commands. The TELNET and FTP commands are the two most frequently used for contacting other TCP/IP stations, but I also find that using FINGER is fun.

Make sure you check the STATUS and TCP STATUS before going off line to make sure all sessions have been completed. You'll be surprised quite frequently to find other stations sending you messages, uploading or downloading files, and you didn't even know they were connected.

There were a couple of things that I didn't understand when I first got on the air with TCP/IP, so I'll pass those on to you now. To enter messages or to read messages, you have to escape NET and then enter the BM Mailer from the DOS prompt. To escape, you enter an exclamation point (!) at the NET prompt, then enter BM at the DOS prompt. When

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TCP/IP Column

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"free" syntax. Because of the symmetry of the terminals or processes, every host has the opportunity to negotiate its options.

The NVT has a printer (or display) and a keyboard. The keyboard produces outgoing data which is sent over the TELNET connection. The display represents the incoming data. To help sustain a high level of performance on the network, echoes to the display are not expected to traverse the network. The option for enabling a remote echo mode exists, but no host is required to implement it. The data representation used is a 7 bit ASCII code in a 8 bit field, except as modified. The NVT can be viewed as a half-duplex device operating in a line-buffered mode. This is the default option set in use before negotiation begins with the host.

The communication between the client and server is handled with internal commands, which are not accessible by users. All internal TELNET commands consist of two or three byte sequences, depending upon the command type. The Interpret As Command (IAC) character is followed by a command code. If this command deals with option negotiation: the command will have a third byte to show the code for the option referenced. I will not cover the various commands here, but instead refer you to the documents which specify the various TELNET options, the RFC's (Request for Comments). The TELNET protocol is covered by quite a number of RFCs, too numerous to mention here. For starters, try RFC 854, which is the basic protocol specification. Next, you should give a look to RFC's 856, 857, 885 and 930.

RFC's

The Internet protocol suite is still evolving through the mechanism of RFC's. New protocols (mostly application protocols) are being designed and implemented by researchers, and are brought to the attention of the Internet community in the form of an RFC. Some of them are so useful that they become a "recommended" protocol, that is, all future implementations of TCP/IP are recommended to implement this particular function or protocol. Other RFCs are purely research ideas and not ready for implementation. Therefore, a status attribute is given to each RFC, indicating the stage of evolution and acceptance of this particular idea for the TCP/IP protocol suite.

All RFCs are available publicly, both in printed form and as Internet mail from the Network Information Center (NIC). They can be obtained in printed form from:

DDN Network Information Center
SRI International
333 Ravenswood Ave.
Menlo Park, CA 94025

The electronic version are available on a number of places on and off the Internet. If you have any trouble getting to one you want, contact me at my electronic addresses below and I will try to give you a hand.

Wrapup

The big points I wanted to make this month with you was the importance of the application protocols and there role in the whole TCP/IP suite of protocols. If you are interested in any specific application protocol, such as FTP and even NFS, get a copy of the appropriate RFC and give it a read. The only way I think that you'll really become familiar with the TCP/IP suite of protocols is to start out on a process of discovery by charting your way through the RFCs. Armed with the RFCs and a copy of the source code for the KA9Q NOS, you should be all ready to embark on your adventure. Good hunting!!

In my next column, I will talk about the future of NOS in the amateur packet radio world. Till then, I can be reached at 75210.10@compuserve.com on the Internet or WA8DZP @ K3MC.#NORCAL.CA.US on the PBBS network. Be seeing you!

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Putting TCP/IP On The Air

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you're finished with the messages, you enter "q" to get back to the DOS prompt and then enter "exit" to resume operation of NET. To get out of NET completely, you enter "exit" at the NET prompt.

When you have things set up as you like them, send me a message and let me know you're on the air (wb9loz%wb9loz@w6rfn). If you're in the Bay Area we can meet for fun and games on Marc's system. Enter: "telnet noe.kg6kf 6715", and beware of the Wizard!

A new TCP/IP program called NOS is now in development and several stations here in Northern California are already using it quite successfully. Once you get on the air with NET, you might want to upgrade to NOS in time. NOS is available for the PC/clones by sending two 5 1/4" disks or one 3 1/2" 720kb diskette to W. E. Moerner, 1003 Belder Drive, San Jose, CA 95120-3302 in a mailer with return postage. NOS for the Mac is available from Doug Thom, N6OYU, (408) 253-1306, 1405 Graywood Drive, San Jose, CA 95129-4778. Amiga NOS is available on Compuserve in Hamnet Library #9 or by contacting Chris, WA2KDL @ K6VE.#SOCA.CA. UNIX and other operating systems can get the c code for NOS from various internet ftp sites. Contact marc@noe.kg6kf for further information (KG6KF @ K3MC on the BBS circuit).

Sites that are already on NET can get many flavors of NOS from W6RFN by anonymous FTP in the /public/nos-code directory. He has built up an extensive help file directory on W6RFN to assist the beginner on NOS. N6PAW, KG6KF, and W6RFN are constantly recompiling the source code to make it adapt to their needs and will be glad to share their experiences.

Enjoy your TCP/IP experiences!

73, Larry, WB9LOZ

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Tidbits

Check out page 152 of the April, 1991 issue of Scientific American. There is a short half page article on the new no-code Technician.

Remote Linked Message/Data Distribution System

Marcello Soliven, KJ6QA

(Editor's note: Marcello continues reporting from the hinterlands of Florida. To those of us with kids out here on the Left Coast, the thoughts of Disney World on the Right Coast don't sound like an "exile", but then again it would be an exile without hot tubs and sushi.)

Greetings again from the tropics. So much has happened since the last issue of DOWNLINK.... whew!! I have to admit that some of my radio time has been replaced by one-way QSO parties with Peter Arnedt.

Realizing the need to thwart the woes of a potential news junky, I had to just "say no" to the news and put my energies toward rehabilitation. I cast the tv remote aside and ran for sanctuary — the ham shack. As I entered I was greeted with the warm, amber glow of three packet monitoring systems. While monitoring 1 hf and 2 vhf channels, my electronic scribes of packetdom cataloged with great accuracy the data transfers, bbs beacons, and other digital events of most recent history. Well, maybe it wasn't quite that dramatic, but the multiple monitoring systems spawned a solution to a problem posed by a club event coordinator.

The Problem

Amateur radio and amateur radio assisted civic events are often comparatively large. Events may be divided into smaller areas such as pavilions, arenas, fields, blocks, or even different cities or towns, thus making logistics interesting at best. Information from a central or command point will need to be disseminated that contains data pertaining to event coordination, safety announcements, participant/spectator bulletins, etc. Voice radio is adequate for security or general purposes but falls short when larger volumes of data have to be moved to specific places quickly. Packet radio is a natural solution and the TAPR standard helps simplify the software task. The following ideas are offered as enhancements that can spice up an event and perhaps its efficiency.

A Solution

1. Use packet linked remote displays/monitors each consisting of...

- A TNC with standard TAPR command set.
- A receiver (scanner is usually ok).
- A terminal device, Vic-20, they're common, easy to use, and cheap. The Vic-20 utilizes bigger characters which are easier to read, especially from the back of small crowds.
- A color display, 19 inch or larger if possible.

2. The TNC can be set to a specific callsign or address name and decode data sent specifically to that device.

3. Several monitoring units can have the same address, thus allowing group related distribution of a data type.

4. Another approach to decoding specific data would be to set the budlist so as to exclude impertinent data.

5. Since the Vic-20 also provides NTSC video, another suggestion may be to use an ATV transmitter for additional distribution. In this case station ID

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California's Digital Public Information System

From Disaster Research, January 3, 1991

The California Office of Emergency Services (OES) in partnership with California broadcasters is testing a new approach to emergency public information delivery.

The "Emergency Digital Information System" (EDIS) links digital radio transmitters to emergency-management agency computers. The result is an official "news wire" which lets local, state, and federal agencies transmit emergency messages directly to printers in radio and TV stations, wire services, and government operating centers.

Broadcasters and organizations for the hearing-impaired have embraced EDIS, calling it an important supplement to the Emergency Broadcast System (EBS). A bill signed into law by Governor George Deukmejian this fall directed California OES to investigate possible statewide implementation. The experiment has drawn nationwide attention in the broadcast industry trade press and sparked the interest of FEMA and FCC officials in Washington.

EDIS receivers can be assembled for less that $500 (including printer) using readily-available "scanner" radio receivers and a ham "packet radio" modems. The digital output of the receiver can be routed to a printer, or directly into a newsroom computer system or TV graphics generator.

Authorized officials can originate emergency news releases over EDIS from terminals on several existing government computer networks. The largest of these is the California Law Enforcement Telecommunications System (CLETS) which supports over 14,000 terminals in law enforcement and dispatch centers statewide. EDIS is also linked to the computers of the National Weather Service and the U.S. Geological Survey.

The pilot project has been in operation serving the San Francisco Bay and Sacramento Valley areas since June. California OES hopes to extend EDIS service into Southern California during 1991.

For more information write or e-mail:

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EDIS Project Coordinator
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TAPR Annual Meeting

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strategy was to have redundancy through multiple independent satellites.

More pictures: UoSAT OSCAR-15, which failed shortly after launch and hasn't been heard from since. The Microsat/UoSAT deployment mechanism: a spring, compressed with a bolt. The huge crowd of quality control people it takes to supervise the operation of tightening four bolts to mount a Microsat to the ASAP. Cleanroom equipment: just home PC's, and donated gear from Kenwood, Icom, MFJ, and TAPR. NK6K attaching the umbilical cord to a Microsat, for charging and monitoring on the ASAP. A spider found in the cleanroom. SPOT-2, the primary payload. SPOT-2 and the Microsats mounted for launch - boy is SPOT-2 big compared to the Microsats!

The pacsat mission was written up in an interview published in the May 1984 issue of Byte. The original plan was a user interface similar to the familiar WORLI-style BBS software. Later it was realized that an interface that permitted and encouraged off-line typing and automatic forwarding would be better; humans type too slowly. With a satellite audible to large areas simultaneously, it makes sense to implement a broadcast protocol that permits listeners to reconstruct transmitted files. This protocol is currently in use for AMSAT News Service bulletins, Keplerian element sets, and so forth.

For non-broadcast messages, the goal was automatic store-and-forward operation. But it wouldn't do to put the routing intelligence in the spacecraft—spacecraft software is hard to write, and forwarding schemes change all the time. So the satellite acts as a file server. The satellite software requires a special header on each file, which contains a description of the file's contents. One field of the file header contains a free-form routing designator. The BBS software can use the routing scheme du jour to decide which files to download and forward.

Question: What equipment is needed to work the Microsats? Answer: 70cm SSB receiver, 2m FM transmitter, PSK modem. PSK was chosen for reasons of efficiency. Software for ground station use is available via CompuServe, TAPR, and others. The spacecraft can also be used as a simple digipeater for realtime QSOs.

Question: What is the life expectancy of the Microsats? Answer: The orbit lifetime is estimated at 107 years. Radiation damage may become a problem after 3 to 7 years. The NiCd batteries have a relatively easy life, and are expected to last a long time. UOSAT OSCAR-11 celebrated its 7th birthday yesterday with the same batteries, and is going strong.

Question: Do you still plan to implement the part of the broadcast protocol that permits ground stations to request fills for missed parts of a file? Answer: Yes.

Question: What kind of NiCd batteries are used, and how are they managed? Answer: The charge level is managed by varying the transmitter power. The batteries are purchased commercially for $15 each, x-rayed, temperature tested, and grouped into sets matched for charge and discharge rates. From 200 batteries, 6 sets of 8 matched cells were obtained. Compare with the manufacturer-qualified price: $700 each.

Lyle Johnson, WA7GXD, reading a letter from Tom Clark, W3IWI SAREX

About 90% of the logs from WA4SIR's operation on the space shuttle have been processed. They amounted to 400K of data plus 4 inches of paper listings. The QSL cards will be ready soon; the Goddard ARC will distribute them. 238 "gold star" 2-way QSOs were logged by the GRiD laptop computer aboard the shuttle. 800 "silver star" QSLs will be awarded for stations heard by WA4SIR and awarded one of the 1700 QSO numbers. The QSO rate averaged about 20 per hour, peaking at 30 or 40 per hour. USA stations were greatly disadvantaged by interference, and by failure to run low modulation. 35 countries were logged, but no European stations were logged except a few SWL reports. It required over 200 pages of documentation to get authorization to carry the SAREX equipment on the flight.

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Remote Linked Distribution System

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should be included in each screen's worth of data.

6. With some programming creativity, use of the Vic-20 would also allow graphics and text together. Although it hasn't been fully tested, it is possible that stop-frame animation may be generated and sent by the command point. One Vic-20 screen equals about 1 packet at a paclen of 255. Through-put is perceived to be slow.

7. To keep the system simple, use of just a receiver is suggested. In some cases, however, it may necessary to use a transceiver and take advantage of the full error detection scheme. Doing so, however, may preclude the use of the group address unless a cluster-like dissemination program is used by the originating or command point.

8. Use of a transceiver and digipeater capability at the remote site(s) will enhance the physical range of the network. This has some intuitively obvious advantages.

9. Also as in #8, it will be possible for the command point to test the integrity of the entire monitoring system by "bouncing" a test packet to itself throughout the network. Note : It may be prudent to have at least one monitoring unit setup with a transceiver. This will allow communications to a system meeting the "unattended" criteria and avoid the "one way communications" rule problem.

It's been fun piecing this system together and trying various options. I'm sure that there are other possibilities of which I'll leave to your discovery. Drop a line to the address below and share ideas. while in my exile to Florida, I have become very active in scuba diving. In the next issue I hope to report on an underwater communications experiment that may be the first of its type.

'til next time.....

73, Marcello, KJ6QA (in exile)

kj6qa @ n4joa.#wpbfl.fl

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TAPR Annual Meeting

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Bob Nielsen, W6SWE, described a message from Jerry Crawford.

A company called Hadron (spelling?) has a packet radio controller product, the PRC6064A, which is based on licensed TAPR technology. These devices are being used by special forces in Operation Desert Storm.

Al Dennis, who has some connection to the Department of Defense, spoke up about DoD use of amateur packet equipment. They've been using it since we started. It is used for man-carried single-threaded narrowband links. The packet controllers work naturally with the laptop computers and digital radios they already have in the field. The 18th Airborne Corps has been building up applications. Amateur-like packet is a de facto standard, because it's cheap and give interoperability.

Packet is used both point-to-point and in networks. For logistic information transmission, packet replaces Jeep shuttles. Networking is coming, and interfaces to the DDN. They want to extend the DDN right into the jeeps in the field.

Question: Are you aware of tactical front-line use of amateur packet gear in Desert Storm? Answer: Yes! It is being used between camps in the desert. Then as the frontline troops advance, they outrun the logistics people - and use the packet thin-links to keep in touch.

Question: Can you please give this talk to the FCC? Answer: Not sure we can get involved. We did push for reciprocal licensing with Persian Gulf states. Question: Regulatory issues are getting to be a problem. Pointing out the benefits of amateur radio may help keep the regulators from getting out of control. Answer: We don't normally deal with the FCC, but I'll do what I can.

Question: Does the enemy have any trace of this kind of capability? Answer: No specifics, but note that TNC-2's are available world-wide, and so are smart people. NK6K: Note that they aren't using the TNC-2's modem through a voice radio like we do. They connect digitally, through a Crypto unit. So the communications wouldn't be easy to monitor.

Question: How well does it perform? It's not really optimized for this kind of work. Answer: It works well. Better than the other stuff they have. The amateur packet gear is the only error-correcting protocol they have that works on half-duplex radios. They even use it on UHF satellite links, which have just a few poor-quality channels available. NK6K: We have a cheap satellite design you might be interested in... Answer: We're very interested, and we've had proposals for years, but haven't gotten very far.

Lyle Johnson, WA7GXD
TAPR/AMSAT DSP Project

TAPR and AMSAT undertook a joint project, spearheaded by N4HY and W3IWI. The idea was to handle the proliferation of different modems for use on HF, Microsats, RUDAK, and so on. By digitizing the analog signals, a high-speed processor can be used to simulate filter, PLLs, and other modem components. When the next new modem is needed, all that's required is a new program for the DSP board — it's only bits.

The original efforts used the Dalanco-Spry Modem 10, a PC plug-in board based on the TMS32010 first-generation DSP processor from Texas Instruments. In 1988, the DSP project proposed a standalone box with a TMS32015 (a slightly improved TMS32010), 4k words of 70ns memory, 8-bit analog I/O, provisions for a second DSP board in case extra horsepower is required, power supply, and V40-based controller board, all plugged into a back panel interface board. Boards were laid out, and some prototypes were built. Then the Microsat project got under way, and key project personnel were suddenly very busy.

In January 1989, after the Microsat launch, the hardware team was freed up. The DSP project was revived at the 1990 TAPR meeting. After a few months, a new design evolved: a PC plug-in board, based on a newer TMS320C25 processor. By using a PC plug-in, the project can take advantage of cheap IBM PC development platforms, at least for the initial version. This is great except for Japan, where the popular PCs don't have the IBM PC bus. The TMS320C25 is

10th ARRL Computer Networking Conference

27- 29 September 1991, San Jose, CA

The NCPA has been selected by the ARRL to host the 10th ARRL Amateur Radio Computer Networking Conference which will take place on September 27-29, 1991 in San Jose. Glenn Tenney, AA6ER, will be this year's conference chairperson. We are planning a variety of events throughout the conference weekend. Our plans are still being solidified, but we are planning: An afternoon of in-depth technical "tutorials" on Friday; a very special "theme" dinner Friday night; the CNC itself all day Saturday; a banquet dinner on Saturday night, complete with a special guest speaker; and something special on Sunday — even if you didn't attend the rest of the CNC.

More information on the conference will be available in the next issue of *Downlink* and other Ham magazines. Instead of waiting, send AA6ER a SASE (this is a low-budget conference) and we'll send you complete information. Send your SASE to:

Glenn Tenney
10th ARRL CNC
2111 Ensenada Way
San Mateo, CA 94403

We've worked out a special room rate at the conference hotel, so start making your plans now.

Past conferences have attracted over 150 participants from all over the U.S. and Canada, and more recently from other parts of the world. Conference speakers share the results of their most recent work at the leading edge of amateur packet radio. Proceedings of past conferences are available for a nominal cost from ARRL HQ in Newington, CT. Please contact the ARRL for an authors' packet. The deadline for papers is the beginning of August, and that will be here before you know it.

much more capable than the TMS32010 or TMS32015. It was too expensive when the project started, but now there is a version in the high $20's range.

The radio interface is still 8 bits wide. This gives about 40dB useful dynamic range. This is thought to be enough; the beta test will tell. Miscellaneous I/O like up/down tuning buttons are provided for. A sample clock phase-shifting circuit makes it possible to use lower sample rates. A watchdog timer is included. The DSP board has no ROM; it is booted from the PC. It takes up just 16 addresses from the PC's I/O space, and no memory addresses at all. The PC can access DSP memory without disturbing the DSP processor, by inserting just 1 wait state per access. An 8530 serial communications chip is included on the DSP board so it can handle the TNC functions easily. It should be especially easy to interface to the KA9Q TCP/IP software, since that software already supports the 8530.

A 6-layer beta test board was displayed. It's fully functional, with just a few white wires. The 4th of a planned 10 beta test boards is currently under construction. The beta test goal is to get some applications running to verify the applicability of the hardware. Then the production phase will begin.

There was a discussion in the TAPR Board meeting about whether the DSP board should be sold as a kit or fully assembled, or something in between. Construction of the DSP board requires 10 to 20 hours of careful work with a suitable temperature-controlled soldering iron. Beta test results will indicate if a kit is practical. A quick poll of the audience indicated that many people would be interested in a kit. Most of those liked the idea of having the soldering done for them, even if the soldered boards were untested. It has been claimed that assembled and tested boards would only cost $35 to $50 more. A poll showed that nobody would be interested in building the kit if the A&T version only cost $50 more.

Question: When can I buy one? Answer: Depends on how the beta test goes. Definitely not by Dayton this year, but very confidently before Dayton '92.

Question: What software will be included? Answer: We intend to provide a monitor/debugger, assembler, and applications, hopefully including source code. The intention is to provide the tools required for code hackers, AND at least a minimal set of modems and packet applications for operators. One member of the software team is into images, so expect an SSTV application. Another member proposes to create a spectrum analyzer.

Question: How much compatibility will there be between this board and the other platforms announced by vendors? Answer: Not much. There are significant differences, such as a different DSP processor. The algorithms will be the same, but the code will have to be rewritten. There is a European group that has a small board based on the DSP56001 used by the other vendors; they have implemented a bit-banging HDLC driver on the DSP chip.

Question: I want to plug in my scanner and receive 9600 bps broadcasts. How do I get this done by a certain date? Answer: mumble mumble.

Question: What baud rates will the DSP board be able to support? Answer: It should be able to handle FSK up to 9600 bps with no problem. Nobody's quite sure if it'll handle something fancy like a V.29 modem at 9600 bps. Comment: Telebit Trailblazers use this processor, and they do V.29.

Question: Can the board be sped up? Answer: Yes. It's designed to go 40 MHz. You just need to plug in faster parts. The limit will probably be the PALs, which need to be 7ns parts to go 40MHz. N3EUA: With faster DSP you may be able to get a 2X speedup, but you'll never get another order of magnitude speedup. You have to choose a performance class and build the best solution for that class.

Question: What range of sampling rates can it handle? Answer: Up to about 400 kHz. A fast sample rate like this is useful for non-modem applications, like spectrum analyzers. That was one reason for choosing 8-bit I/O instead of more precise, slower converters.

Question: How much power does it require? Answer: No measurements have been made yet, but only two chips on the board get noticeably warm. Guess: less that 5 watts.

Question: Other than DSP software gurus, are volunteers needed to help with the DSP project. Answer: No.

Harold Price, NK6K Honored

Lyle Johnson, WA7GXD, presented a plaque to Harold Price, NK6K, for his contributions to packet radio since 1982. In accepting the award, NK6K said that he sees himself as a link between the experimenters on the forefront of technology and the users of the technology.

Continued in the next issue...

NCPA Board of Directors Meeting Minutes

Meeting of January 13, 1991

The NCPA Board met on January 13, 1991 at General Parametrics in Berkeley. Present at this meeting were the following board members: WA8DZP WD6CMU KA6ETB KB6OWT WB9LOZ N6QMY

Also in attendance were: AA4RE K3MC W6VOM KC6OOM KB6TKL N6VOM

Business

1. Pat N6QMY made the treasurer's report. The current balance in the organization's account is $2,012.33. No progress has been made as yet on the incorporation of NCPA. K9AT has offered to help get this expedited.

2. Dewayne WA8DZP made the secretary's report. There are currently 340 members of NCPA. We are currently in the process of determining how many members of the organization are ARRL members so that we can apply to become an ARRL affiliate organization. He reported that we have been in violation of USPS regulations as to how we have been mailing out the newsletter. If metered postage labels are used in the future, then the newsletters must be mailed from the post office indicated in the stamp.

3. Mike K3MC made the Newsletter Editor's report. The current newsletter will be Mike's last. He directed the Board to look for a new newsletter editor. Mike asked the Board to allow past issues of the Downlink newsletter to be posted to the Internet so that it could be made available to the public at large. A motion to this effect was made and passed by the Board. Future issues will be posted three months after release to the Internet.

4. Roy AA4RE made the Frequency Coordinator's report. He discussed the NCPA proposed 220 MHz Band Plan for the FCC-mandated changes to the 220 MHz Band. He proposed an across the board cut of 40% in the number of channels. Everything below 222 MHz has to go. This means that we will lose one LAN channel. The DXPSN will have to move from 221.4. WD6CMU was tasked with writing a letter to the DXPSN people to ascertain their plans for the loss of 220-222 MHz. WA6AEO feels that we can trade the 430 MHz channels for space in 420 MHz which is not used. AA4RE will be contacting NARCC to discuss our band plans.

5. Fred K6RAU, the PBBS Coordinator was not present, so there was no PBBS report.

6. Larry WB9LOZ made the Education Coordinator's report. NCPA will co-host an introductory packet seminar with Kantronics which will occur in May. The Board authorized the printing of 500 copies of Larry's "Introduction to Packet Radio," which will be sold for $5 per copy.

7. Steve KA6ETB made the Emergency Coordinator's report. He received no response to his bulletin requesting assistance on coordinating with other existing services or emergency organizations.

8. NCPA has been chosen by the ARRL to host the 10th ARRL Amateur Radio Computer Networking Conference. The dates for the event will be September 27-29.

9. Mike K3MC reported that Glenn AA6ER has agreed to be the "interim" newsletter editor.

10. The tentative date of the next General Membership meeting was set for March 31st. Eric WD6CMU will arrange for a meeting place. The deadline for agenda items for this meeting will be February 15th. A notice of the meeting will be mailed at the end of February.

11. A short discussion on a replacement for the forwarding backbone resulted in the decision that this was an NCXPN issue, which should be referred to them.

The meeting concluded as there was no further business. The board did not meet in closed session.

Dewayne Hendricks WA8DZP

NCPA Secretary

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N6QMY @ N6QMY

Dewayne Hendricks, WA8DZP
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Larry Kenny, WB9LOZ
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FCC Report and Order on 220Mhz

From the ARRL Bulletin 15

The FCC on March 14 issued a report and order in PR Docket 89 552, adopting rules for the use of 220 to 222 MHZ by the Private Land Mobile Service. Amateurs will be required to discontinue all operations in the 220 to 222 MHZ band 90 days after the effective date of these rules, which has not yet been announced. Amateurs probably will have to vacate the 220 to 222 MHZ part of the band in late July.

Where to Find a BBS

N0ARY-1	Sunnyvale	144.93
KE6BX	Hollister	144.93
KJ6FY-1	Benicia	144.93
KI6YK	Danville	144.93
WD6CMU	Richmond	144.97
N6EEG	Berkeley	144.97
W6FGC-2	Twain Harte	144.97
K6LY	Monterey	144.97
N6LDL	Los Gatos	144.97, 145.71[1]
KI6WE	Pleasant Hill	144.97
KD6XZ-1	Sacramento	144.97, 441.50
AA4RE-1	Gilroy	144.99
KA6FUB	Martinez	144.99
N6OA	Lemoore	144.99
W6PW-3	San Francisco	144.99
WA6RDH	Dixon	145.01
KG6EE	Santa Cruz	145.07
KI6EH	Santa Cruz	145.07
N6IIU-1	Palo Alto	145.07, 223.56
KE6LW-1	Yuba City	145.07
KG6XX-1	Carmichael	145.07, 441.50
W6CUS-1	Richmond	145.09
N6ECP	Redding	145.09
KB6IRS	Soquel	145.09
N6IYA-2	Felton	145.09
K3MC	Fremont	145.09
WA6NWE-1	North Highlands	145.09, 441.50
K6RAU-1	Merced	145.09
WA6YHJ-1	Livermore	145.09
W8GEC	Boulder Creek	145.73
WA6HAM	Pittsburg	145.73
KB5IC	San Jose	145.73
KA6JLT-2	Menlo Park	145.73, 145.71[1]
N6MPW	Ben Lomond	144.79
WB6ODZ-1	Lake Isabella	145.79[2]
N6QMY-1	Fremont	145.79
N6REB-2	Modesto	145.79

[1]Experimental 9600 baud port, subject to change
[2]May be off-line due to remodeling

The Band Plan

50MHz

51.12	SOCAL backbone
51.14	Experimental
51.16	Kybd to Kybd
51.18	Experimental

144MHz

144.91	keyboard-to-keyboard
144.93	LAN[1]
144.95	DX Spotting Network
144.97	LAN
144.99	LAN
145.01	keyboard-to-keyboard
145.03	keyboard-to-keyboard
145.05	keyboard-to-keyboard
145.07	LAN
145.09	LAN
145.71	9600 baud TAPR compatible
145.73	LAN
145.75	TCP/IP
145.77	DX Spotting Network
145.79	LAN
146.58	DX Spotting Network

[1]Used by TCP/IP in the Sacramento area

220 MHz

220.80-220.89	Experimental
220.90	Superbackbone
220.91-221.00	Experimental
221.04	DX Backbone
223.42	node uplink (SBAY)
223.52	node uplink (NBAY)
223.54	node uplink (EBAY)
223.56	keyboard-to-keyboard[1]
223.58	node uplink ("Other")
223.60	node uplink (SACVAL)

[1]Shared with BBS forwarding in Monterey Bay area

430 MHz

100KHz-wide channels

433.05	TCP/IP
433.15	NET/ROM backbone
433.25	DXPSN backbone

20KHz-wide channels

433.31	backbone
433.33	backbone
433.35	backbone
433.37	backbone
433.39	backbone
433.41	LAN interlink
433.43	9600 baud TAPR compatible (pending)
433.45	digital experimental & backbone
433.47	NET/ROM interlink, keyboard
433.49	TCP/IP
441.50	all

No channelization has been done for these bands. Some activity is present.

903-905 Mhz
915-917 Mhz
1248-1252 Mhz
1297-1300 Mhz

What is NCPA?

NCPA, the Northern California Packet Association, is an organization formed to foster the Digital Communications modes of Amateur Radio. So far, we have defined our goals as:

- **Education**
- **Coordination**

Education means making information available about various Digital modes, and this newsletter is but one part of that education process.

Coordination activities include frequency coordination (NCPA is recognized by NARCC as the official packet radio frequency coordinator) as well as coordinating people and their various uses of packet radio, be they DX Cluster, BBS, TCP/IP, keyboard-to-keyboard, NET/ROM, Traffic/NTS, Emergency uses of packet, or even experimenting with new frontiers of various digital modes.

We in NCPA believe that the next revolution in Ham Radio will come about in Digital Communications Technology, and in the beneficial coordination among all users of ham Digital Communications Technologies.

We invite you to join NCPA! Become part of the most dynamic group of packet folks in Northern California!

NCPA *Downlink*

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First Class Mail